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DEBT DYNAMICS IN A SMALL OPEN ECONOMY

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Abstract: The paper first examines how the growth rate conditions for sustainable deficits are applied to economies with both domestic and foreign debt and to alternative exchange rate regimes. These conditions are then analysed in the case of Greek economy in the 1980s. The impact of the fiscal expansion of 1981 - 1985 and the devaluation of 1985 on the already accumulating process of debt are studied and conclusions are drawn about the direction of sustainable policies.

January 1990

1. INTRODUCTION

Governments who persistently run budget deficits should ensure that the accumulated debt to the private sector does not eventually reach uncontrollable levels that will make the state to loose the confidence of the lenders and perhaps lead to explosive social situations. Usually a deficit is considered sustainable if it leads to finite debt-to-output ratios, although how such a reasonable ratio is defined depends critically on the political values and the institutional framework of the society. In advanced economies with trustworthy governments and well-developed financial markets the public is willing to hold high levels of governments debt (for a recent cross-country comparison see Roubini and Sachs, 1989), in contrast with third-world societies where individuals are very cautious in accepting state liabilities, as they fear that the state will eventually renege on its obligations.

For a country with no foreign debt liabilities, sustainability is ensured by the celebrated condition of an output growth rate higher than the real rate of interest paid to debt holders. Depending on how much these two rates differ, net budget deficits as proportions to output are by no means required to be zero, since the growing character of the economy makes the interest payments a matter of decreasing importance relative to the production capacity of the country.

In situations of stagnation, this condition is not met. In fact, high real interest rates might themselves be the primary cause of slow growth (see Fitoussi and Le Cacheux, 1989), and interest payments will absorb an increasing part of the stagnant output. Debt will accumulate unstably even if the net budget deficit is zero! Such situations may be corrected only through restraining fiscal action (Blinder and Solow, 1973) the relative intensity of which varies proportionally to the size of the debt-output ratio.

Therefore, one has to look at the interactions between debt, deficits and the economy as a whole in order to draw conclusions about the importance of the former. As Buiter (1989) has clearly pointed out, to use only the deficit as a measure of the debt problem may be grossly misleading, since it is a poor or even perverse indicator of shortrun cyclical effects, does not reveal the allocative or structural impact of fiscal policies, and conveys little or no information on the longrun consistency of fiscal stance.

In economies with external deficits the traditional medicine has been the devaluation of the currency that, given that the Marshal-Lerner conditions are satisfied, improves the trade balance and thus relieves the foreign liabilities of the country. However, the foreign debt measured as a proportion of domestic output is worsened by devaluation because of the revaluation effect on the liabilities that are customarily contracted at foreign currency. This is due to the worsening of the terms of trade caused by devaluation if one considers foreign debt as an analogous to imports with zero price elasticity, i.e. one that the country is obliged to "buy".

When the foreign debt is very high, the revaluation-induced deterioration in domestic terms might be close or even outrun the improvements coming from better trade opportunities. In the extreme case this leads to a "<u>debt trap</u>" in which devaluations worsen rather than improve the external imbalance as a whole. On the other hand appreciations in such cases would lack credibility and fuel speculative attacks, so that there seems to be no viable policy for the country; see Christodoulakis, Meade and Weale (1986) for an analysis of this situation. Even when a country is safely away from a debt trap, devaluations may not be pursued by governments that give priority to lower inflation (see Van der Ploeg, 1989) or when they believe that foreign trade deficits are compensated by increased capital inflows motivated by the appreciated currency, as has been the case of the US and the UK economies in the '80s.

In the real world, there are economies that have accumulated debt both domestically and abroad, due to chronic budget and current account deficits respectively. It is easily obtained by extension that these deficits would be sustainable, were the economy growing faster than both domestic and foreign real interest rate. If this is not the case, a sophisticated mix of fiscal and exchange rate measures should be adopted to correct the internal and external imbalances.

The purpose of this paper is to analyse the interconnections of domestic and foreign debts and derive the conditions under which deficits are sustainable. By properly including the revaluation effects on foreign liabilities, the growth rate conditions depend on the exchange rate policy. Exchange rate also affects the inflation rate. The latter has crucial implications for the financing of the domestic debt, through the inflation tax and the adjustment of real balances held by the private sector. In this generalised framework, three alternative exchange rate regimes are examined, namely Purchasing Power Parity, Nominal Exchange Rate Stability, and the Floating system.

Under very conventional assumptions about monetary policy and price/wage formation it is found that the growth condition of sustainability is easier to be satisfied under fixed nominal exchange rates rather than in the other two regimes. For a debted and inflationary-prone country, this is effected by exploiting the stock-reducing appreciation effects on foreign debt and by the private sector willingness to hold higher real balances at the lower inflation rate.

The cost that the country has to pay in such circumstances is a larger trade deficit due to the appreciated currency. However this may partly be alleviated if one assumes that the erosion of competitiveness caused by appreciation is eventually regained through a darwinian adjustment at the microeconomic level of the firms that face adverse market conditions. Another improvement will come from the reduction of economy-wide distortions due to inflation, as has been described by Fischer and Modigliani (1978).

In Section 2 a simple model is set up for the dynamics of domestic and foreign debt. Sustainability conditions are derived for the three exchange rate regimes by means of standard stability analysis.

In Section 3 these results are used to examine the domestic and foreign debt positions for the economy of Greece in the 1980s. Growth rate has been substantially lower than foreign real interest rates during the period and this alone could possibly explain the spiralling rise of debt stocks. There took place, however, two major episodes with serious further repercussions on the debt problem.

The first was the unprecedented fiscal expansion between 1981 -1985 initiated in 1981 by the incumbent Conservative government facing the prospect of defeat in the approaching elections, and continued by the Socialist Government at an equally unrestrained pace. After four years, the Socialist government felt the need of a devaluation-cum-wage-freezing policy package mainly aiming to improve the deteriorating trade deficit. Both of these episodes are analysed as decision problems of governments who seek to achieve certain macroeconomic objectives in the short and medium run. It is shown that neglecting the dynamic interactions of stocks or the adverse effect of revaluations may result to a failure to stabilize the domestic and foreign debt, especially when governments are preoccupied by short-term objectives and heavily discount future consequences of their decisions. Possible combinations of budget deficits and rates of inflation are considered diagramatically.

Section 4 summarises the main conclusions and points to possible further elaborations.

2. THE DYNAMICS OF DEBT

A small open economy with both domestic and foreign debt is considered in this section. Although the model is quite general, it has been conceived in order to analyse the debt problem of the Greek economy highlighting particular episodes of the last decade. Some assumptions and parameter values reflect this particuliarity. Domestic debt consists of base money with zero nominal interest, and bills that bear a nominal interest rate. For easiness of presentation the latter are considered as one-period Treasury bills. Both of these assets are owned by the domestic private sector, who otherwise is deprived of holding any foreign asset. Assuming that foreign exchange reserves are held constant, e.g. to a fixed proportion of the country's imports, the only foreign asset that matters in the economy is the foreign debt borne intally by the government.

The economy is assumed to grow at a real rate not necessarily positive which is exogenously determined. There are imports of both production and consumption goods, and their corresponding prices are influenced by the international ones. Combined with a Phillips-curve process of partial real wages resistance, prices are fully determined as a markup on costs. Capital stock is assumed constant throughout so that changes in private wealth are effected through portfolio choices between money and bills.

To examine the dynamics of domestic and foreign debt, we first express them as proportions to the country's output and then derive their adjustment process in continuous-time from the government budget constraint and the current account constraint respectively.

2.1. List of Variables

- $B=b.Y$ Real Budget Deficit, net of interest payments
- $H=h.Y$ Real Interest-bearing debt held by domestic private sector
- $M=m.Y$ Real High-powered money, non-interest bearing
- $F=f.Y$ Real Foreign debt of the government, expressed in domestic currency
- $V=v.Y$ Real Financial wealth of domestic private sector
- Y Real GDP, at factor cost
- g Output growth rate ($g=dY/Y$)
- $J=j.Y$ Trade balance in real terms at domestic prices
- E Nominal exchange rate, price of foreign currency (Depreciation $e = dE/E$)
- P GDP deflator (Inflation $p = dP/P$)
- C Consumer Price Index (Consumption inflation $c = dC/C$)
- W Nominal Wage Rate (Wage Inflation $w = dW/W$)
- X Real Exchange Rate (Real depreciation $x = dX/X$)
- $i,(i^*)$ Domestic (foreign) nominal interest rates
- $r,(r^*)$ Domestic (foreign) real Interest rates
- P^* Foreign prices (Foreign Inflation $p^* = dP^*/P^*$)

Stock and flow variables are all in real terms and denoted by capital letters. Respective low-case characters express them as ratios to output. Price variables are denoted by capital letters, with low case ones expressing their corresponding rates of change. The growth rate and the interest rates are also denoted by low case characters. A starred variable denotes the foreign counterpart, and d is the differentiation operator.

2.2. <u>The Budget contraint</u>

The government budget constraint between time period t and t+dt states that gross deficit is financed by issuing new bills or creating new non-interest-bearing money. In current prices it is written:

$$B_t P_t + i_t H_t P_t + i_t^*(F_t P_t / E_t)(E_t + dE) = d(P_t H_t) + d(P_t M_t) \quad (1)$$

In the left-hand-side gross deficit includes the net deficit ($B_t P_t$), interest payments on domestically held debt, and the interest payments on the foreign debt. Foreign debt is borne in foreign currency, and interest payments are calculated on the value of the stock at the begining of the period t. However, these interest payments in foreign currency should be translated into domestic prices at the prevailing exchange rate at (t+dt), thus including possible devaluations since period (t). In this way, revaluations of foreign stocks are properly taken into account.

In the above form, the right-hand-side of equation (1) <u>does not</u> exclude the possibility of financing the debt by borrowing from abroad. The government may for example run down foreign exchange reserves to partly finance the deficit. Assuming accomodating monetary policy at home, money supply is going to increase by an equivalent amount and this is presicely captured in equation (1). Reserves are then restored to their original levels by borrowing from abroad at the nominal interest rate i^*.

Dividing (1) by nominal GDP ($=P_t Y_t$), employing the low-case notation for variables-to-output ratios and rates of change of prices, and using the dot($\cdot$) to denote time derivatives we arrive at the following form:

$$\dot{h}_t + \dot{m}_t = (r-g+s)h_t + (r^*-g+x)f_t - (p+g)m_t + b_t \tag{2}$$

where s=c-p is the wedge between inflation rates in consumer prices and domestic product prices respectively. The other variables are explained below:

Real exchange rate is defined as the relative price of foreign and domestic product:

$$X = P^*E/P \tag{3}$$

Thus we get for the real devaluation rate per period

$$x = e + p^* - p \tag{4}$$

Real interest rates are obtained by deflating nominal ones by consumer inflation

$$r = \frac{1+i}{1+c^e} - 1 \approx i - c^e \tag{5}$$

where c^e is the expected value of c.

For the foreign interest rates we do not distinguish between consumer and product inflation as country's exports are negligible amount of world consumptions so we shall have

$$r^* \approx i^* - p^* \tag{6}$$

The inflation wedge (s) can be easily expressed in terms of the real devaluation (x) by considering the following equations of inflation formation:

$$c = (1-\alpha)p + \alpha(e+p^*) \tag{7}$$

$$p = (1-\beta)w + \beta(e+p^*) \tag{8}$$

$$w = \bar{u} + \lambda c^e \tag{9}$$

Equation (7) comes from a weighted average price index between domestically produced and imported goods, and is exact for Cobb-Douglas utility functions. Equation (8) expresses prices as a mark-up on wage and imported material and equipment and is exact for Cobb-Douglas production functions. Finally (9) is an augmented Phillips curve determining wage inflation from expected consumer inflation (c^e) and an autonomous inflation term $\bar{u}$ that reflects supply constraints in the Labour market, productivity gains etc, and is assumed exogenous throughout.

Assuming perfect foresight ($c=c^e$), and partial indexation ($0<\lambda<1$) we can combine the above set of equations with (4) to get:

$$s = \alpha x \tag{10}$$

$$p = \frac{\bar{u}}{1-\lambda} + \delta x \tag{11}$$

where for simplicity we set

$$\delta = \frac{\beta+\alpha(1-\beta)\lambda}{(1-\beta)(1-\lambda)}$$

To obtain a more manageable form of (2) we can assume that the private sector holds real balances to an interest-elastic proportion of the interest-bearing debt:

$$m = \varphi(i)h \tag{12}$$

with $\varphi'(i) < 0$. Given that the private sector does not hold any kind of foreign assets, total financial wealth will be composed of only two assets, money and bills. In terms of ratios to output we shall have:

$$v = m + h \tag{13}$$

Hence, (12) is equivalent to assuming (as in Dornbusch,1977) that real balances are kept as an interest-elastic proportion of total portfolio, namely

$$\frac{m}{v} = \frac{\varphi(i)}{1+\varphi(i)} \tag{14}$$

since it can easily be checked that $d(m/v)/di<0$.

Function $\varphi(\cdot)$ is in general non-linear, and should imply $\varphi(\infty)=0$ so that no money is held at excessively high nominal interest rates.

Dropping the argument from $\varphi(\cdot)$ for simplicity we can use (10) and (12) to rewrite (2) as

$$\dot{h} = \left[\frac{i}{1+\varphi} - p - g\right]h + \left[\frac{r^{*}-g+x}{1+\varphi}\right]f + \frac{b}{1+\varphi} \qquad (15)$$

where $i = r+p+\alpha x$.

This expression says that domestic debt as a proportion to output rises because of interest payments at home and abroad, and because of running budget deficits (b). It also rises when interest rates rise and the private sector reduces real balances that have to be covered by further issues of interest bearing bills.

2.3. The External Account

In the external account of the country, foreign debt will rise in order to finance a deficit of the current balance or will be reduced whenever the latter is in surplus. In foreign currency terms we have the following stock-flow constraint for the time period between t and t+dt:

$$\frac{(F_t+dF_t)(P_t+dP_t)}{E_t + dE_t} - (1+i^{*})\frac{F_tP_t}{E_t} - \frac{J_t(P_t+dP_t)}{E_t+dE_t} = 0 \qquad (16)$$

where the trade balance is evaluated at domestic prices prevailing at period t+dt. Dividing by P_tY_t and dropping the subscripts for simplicity we get after some straightforward manipulations:

$$\dot{f} = (r^{*}-g+x)f - j \tag{17}$$

where j denotes the trade balance as a ratio to output. Conventionally assuming a consumption function out of income and wealth, an export function of relative prices, an import function of constant propensity and relative prices and the standard fiscal multiplier effect we can approximate the trade balance to output ratio as

$$j = -\gamma_1 v - \gamma_2 b + \gamma_3 X \tag{18}$$

with positive constants $\gamma_1, \gamma_2, \gamma_3$, and X denoting the level of real exchange rate. Trade balance worsens with a fiscal expansion represented here by a rise in the bugdet deficit, with a rise in wealth through consumption effects and improves with a depreciation $dX>0$. No J-curve effect is assumed.

Using (12), (13) and (18), we rewrite equation (17) as

$$\dot{f} = (1+\varphi)\gamma_1 h + (r^{*}-g+x)f + \gamma_2 b - \gamma_3 X \tag{20}$$

which together with (15) determines the dynamics of the stocks of the foreign and domestic debt respectively.

Equations (15) and (20) may be used in two ways. First, one can assume that the long-run ratios h and f are exogenously determined for the given economy, and then derive which are the appropriate values for deficit (b) and inflation (p) that are sustainable in the longrun. Second, one may take fiscal and exchange rate policy as given, work-out the dynamic paths on which the stocks move towards their steady-state, and obtain the conditions under which they are stable.

2.4. Sustainable deficits and inflation

We consider here a steady-state with constant ratios h and f, a stable real exchange rate ($x=dX/X=0$) and the assumption that authorities always keep a fixed real interest rate. Although function $\varphi(i)$ is meant to change with inflation, we shall further assume here that for reasonable inflation rates velocity of money does not change, and $\varphi(i)$ is constant for convenience.

Setting $\dot{f}=0$ we obtain from (20) that the longrun sustainable net deficit is given by:

$$b = \frac{1}{\gamma_2}\left[\gamma_3 X - (1+\varphi)\gamma_1 h + (g-r^*)f\right] \tag{21}$$

This equation reveals the policy options available for a debted country. In order to continue to run budget deficits ($b>0$) the country has either to grow fast so that $g>r^*$, or to substantially depreciate its currency ($X>0$) in order to accumulate trade surpluses.

Otherwise, it will have to run budget surpluses ($b<0$) which are going to cut down demand and eventually decumulate the foreign debt.

The locus of (21) is shown in Figure 1 by the horizontal line X'X'. If the currency becomes relatively appreciated ($X_2<X_1$) the locus shifts downwards (X''X'') requiring a cut in the longrun deficit ($b_2<b_1$).

The other locus in the deficit-inflation space is obtained from equation (15) by setting $\dot{x}=0$, $\dot{h}=0$ and $i=r+p$ as follows:

$$b = \varphi\, hp - [r - g(1+\varphi)]h + (g-r^*)f \tag{22}$$

and is also shown in Figure 1 by the line h'h'.

Given the debt ratios h and f, and the rates of growth and interest, this relationship reveals a link between inflation and sustainable deficits similar to that derived by Congdon (1987) in a static framework.

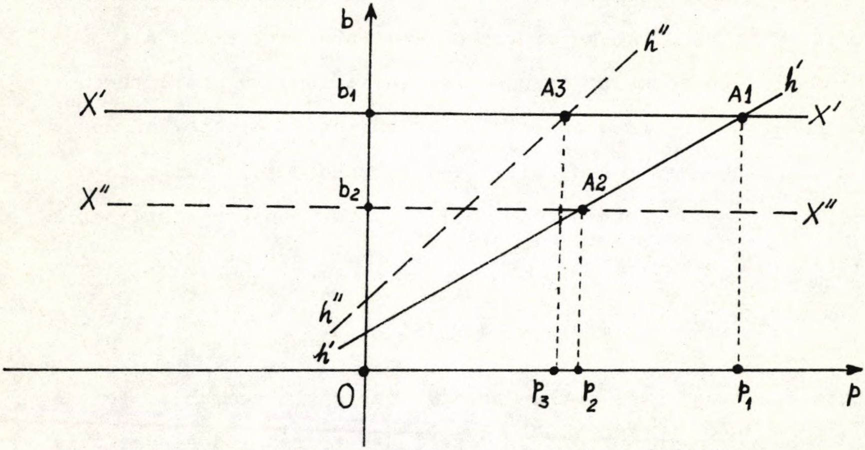


Figure 1: Sustainable inflation and budget deficits.

A higher deficit is sustainable only at a higher inflation rate. Conversely, a reduction in inflation will come about with a cut in budget deficit as shown in Figure 1 by the downward shift of the horizontal line (inflation $P_2<P_1$), effected by a relative appreciation ($X_2<X_1$).

Another way to reduce longrun inflation is to raise h, so that the amount of public debt that the public is now willing to hold is higher ($h_2>h_1$). The slope of (22) increases and the intersection with the horizontal locus is obtained at a point of lower inflation (P_3). The X'X' locus hardly moves in this case as propensity γ_1 is usually very small.

A final possibility for a fast-growing economy to run higher deficits without spurring inflation is to increase the foreign indebtedness of the country ($f_2>f_1$). In such a case both loci

X'X'and h'h' move upwards as (21) and (22) indicate for $g>r^*$, and sustainable deficit (b) increases. This however is not possible for economies with a growth rate lower than the foreign interest rate. The shift will now be downwards and sustainability will require lower budget deficits and a higher inflation rate in the longrun.

The above analysis clearly demonstrates the remarks made by Congdon (1987) that:

" ..the government economy with a strong domestic demand for government debt and considerable external credit worthiness can, on a sustained basis, run a higher budget deficit to income ratio without inflation than that of an economy with weak domestic demand for government debt and little external creditworthiness. A buoyant trend rate of economic growth also obivates the inflationary dangers of budget deficits" (my italics).

In the more general case, where money function $\varphi(i)$ is more sensitive to inflation, the locus h'h' becomes a concave curve that might intersect the locus X'X' twice, and lead to multiple inflation equilibria as studied by Dornbusch and Fischer (1986), and Drazen and Helpman (1988) among others. However, for countries still away from hyperinflation this does not seem to be a realistic case to consider.

2.5. Conditions for debt stability

The next question is under which circumstances the debt does not explode in the long-run. This is best analysed by studying the stability conditions of equations (15) and (20). Naturally, they depend on the specific character of fiscal and monetary policy, and also on the mechanism by which exchange rates are determined.

Here we shall assume that fiscal policy is exogenously fixed by keeping the budget deficit at a constant proportion (b) of output. Monetary policy manipulates the interest rates so that real interest rates are kept constant and money supply equals demand determined by (12). Inflation is determined in the goods and labour markets and, with the incomes policy parameter λ fixed, is given in every period by expression (11). In this way inflation rate depends on the depreciation rate. Three exchange rate regimes are in turn examined :

__Regime I__: Purchasing Power Parity (PPP), by keeping the real exchange rate fixed. In this case we shall have for the real depreciation:

$$x = 0 \tag{23a}$$

__Regime II__: Nominal Exchange Rate Stability (NES). For a small economy this is a close proxy to a multi-country scheme with agreed intramember parities. The obvious contemporary example is the European Monetary System (EMS). Parities towards outside currencies are in practice decided by the strong members of the system and are not influenced by the small country. In this case we shall have $e=0$, so that according to (4) real depreciation will at every period be given by:

$$x=p^{*}-p \tag{23b}$$

__Regime III__: Floating exchange rate (FER). Assuming perfect capital mobility, this regime is typified with the uncovered interest parity condition. In real terms and under the accompanying assumption of rational expectation this condition would imply a devaluation rate given by:

$$x=r-r^{*} \tag{23c}$$

Other cases like a managed nominal exchange rate, a managed real one, etc, can similarly be considered, although the emerging expressions might not be as neat.

Given that inflation rate is endogenously affected by real depreciation only, that real interest rates are fixed and that output growth rate is exogenously determined the dynamics of the debt stocks (h,f) are solely governed by their own interaction. Equations (15) and (20) form a second-order dynamic system which is asymptotically stable if and only if the trace of the associated characteristic matrix is negative and its determinant positive, (see Appendix A). Namely, we require

$$(r^{*}+x-g) + \frac{i}{1+\varphi} - p - g < 0 \tag{24}$$

$$(r^{*}+x-g) \left[\frac{i}{1+\varphi} - p - g - \gamma_1 \right] > 0 \tag{25}$$

These conditions are satisfied when the output growth-rate is higher than the maximum of the three values implied by the right-hand-side of the following inequalities:

$$g > r^{*} + x \tag{26a}$$

$$g > \frac{i}{1+\varphi} - p - \gamma_1 \tag{26b}$$

$$g > \frac{1}{2} \left[r^{*}+x+ \frac{i}{1+\varphi} - p \right] \tag{26c}$$

With a low propensity to consume out of wealth ($\gamma_1 \longrightarrow 0$) the third condition becomes redudant since it can be obtained by adding up the first two. In the rest of this Section we shall concentrate on (26a) and (26b) for simplicity of expression.

These conditions are generalisations of the well-known condition on the growth rate derived for a closed economy.[(*)]

Condition (26a) requires a minimum growth rate determined by the foreign interest rate and thus may be seen as representing the <u>external constraint</u>.

Condition (26b) gives the minimum growth rate as a function of domestic policy factors, thus representing a kind of <u>internal constraint</u>.

Both constraints are crucially affected by the depreciation rate (x). Using (5) and (10) we can rewrite them according to the exchange rate regime in terms of the constant real interest rate and inflation as follows:

	External Constraint	**Internal Constraint**
Regime I, (PPP)	r^*	$\dfrac{r - p\varphi}{1+\varphi} - \gamma_1$
Regime II, (NES)	r^*+p^*-p	$\dfrac{r-(\varphi+\alpha)p+\alpha p^*}{1+\varphi} - \gamma_1$
Regime III, (FER)	r	$\dfrac{(1+\alpha)r-\alpha r^*-p\varphi}{1+\varphi} - \gamma_1$

Let us examine first the external constraint in the three regimes. If the debted country is prone to inflation then the external constraint is less difficult to be attained in NES rather than in PPP. This is because of the fact that domestic inflation is higher than abroad, thus the currency will actually be appreciated and revaluations of the foreign debt will be

(*) They also generalise the conditions derived in an earlier paper by Christodoulakis, Meade and Weale (1986) for an open economy with domestic and foreign assets, but under the more restrictive assumptions of zero growth, fixed prices and absence of money demand.

reducing the stock to output ratio. The process of foreign debt accumulation will be stabilised, but its steady state might be considerably higher due to the continuous deterioration of trade balance. Quick microeconomic adjustment will help to partly alleviate this problem. Had the trade balance been assumed to have the J-curve property, appreciation would have an <u>improving</u> effect in the shortrun, that could result in lower levels of foreign debt.

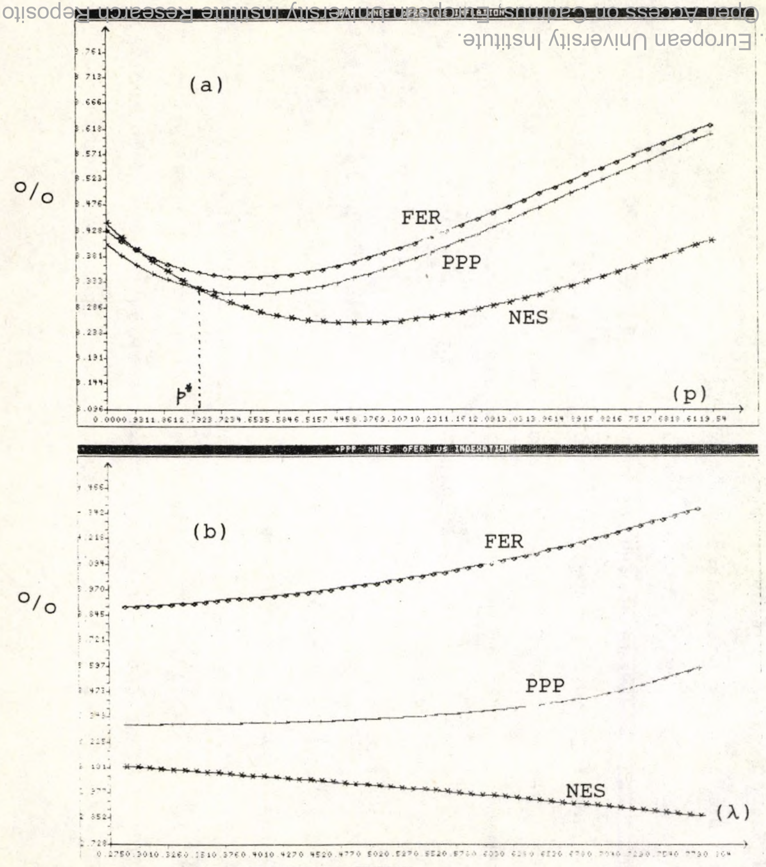
The floating regime is superior to PPP only when the debted country follows a relaxed monetary policy with real domestic interest rates lower than foreign ones. This however is not likely to last for long, because it induces capital flights away from the debted country, which further deteriorate the current account and force real interest rates to rise above the foreign ones in order to counterbalance the associated risk premia.

Under the assumptions of a debted inflationary country with higher real interest rates than abroad, the easiness to satisfy the external contraint is ranked as follows:

$$\text{NES} > \text{PPP} > \text{FER}$$

with > denoting preference in the above sense.

The internal constraint is primarily determined by domestic real interest rates, inflation and, except in PPP, by the share of imports in consumption. It also depends on the specific nature of the inverse velocity function $\varphi(i)$. Two alternative cases are examined here under the common monetary policy of fixed real interest rates.

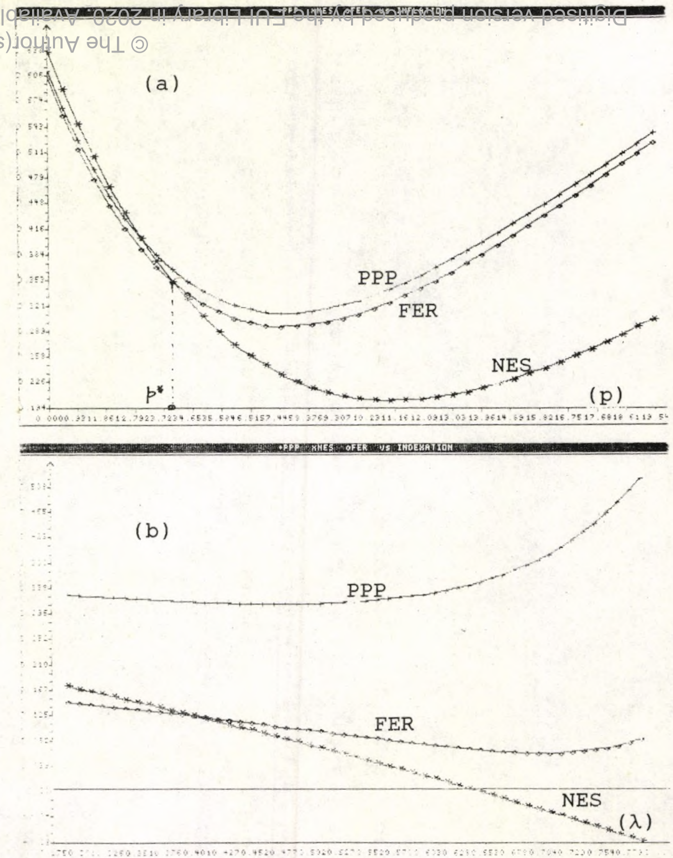


Minimum Growth rates

Figure 2 : The case $r>r^*$

(a) : Versus Inflation

(b) : Versus Indexation



Minimum Growth rates

Figure 3 : The case $r<r^*$

Case I: Assuming(*) that velocity is a function of real interest rates only, then we have $\varphi=\varphi(r)=$constant and the minimum growth rate implied by the internal constaint becomes:

$$g_{min} = \frac{i}{1+\varphi(r)} - p - \gamma_1$$

and by using (10) and (11)

$$g_{min} = (1+\varphi)^{-1}\left[r-\gamma_1\ (1+\varphi) + (\alpha-\varphi\delta)x - \frac{\varphi\bar{u}}{1-\lambda}\right] \qquad (27)$$

When the debted country is inflationary prone ($p>p^*$) and keeps higher real interest rates than abroad ($r>r^*$), we can rank the three exchange regimes according to the sign of expression ($\alpha-\varphi\delta$).

- For a high velocity of money (i.e. low $\varphi(r)$) such that

$$\varphi(r) < \alpha/\delta$$

we have the following ranking of the relative easiness to satisfy the internal constraint under the three exchange rate regimes:

NES > PPP > FER

- For low velocities, such that $\varphi(r)>\alpha/\delta$ the ranking becomes

FER > PPP > NES

(*) Since real interest rates (r) are fixed, this assumption is equivalent to assuming constant velocity as Giavazzi (1989) did for the european economies.

<u>Case II</u>: Adopting an inverse velocity function similar to that suggested by Cagan (1956)

$$\varphi(i) = k\, e^{-vi} \tag{28}$$

and setting the nominal interest rates from (5) equal to

$$i = r + c^{e} = r + p + \alpha x$$

one can calculate the domestically required minimum growth rates in the three exchange rate regimes. Keeping our assumption on higher domestic inflation than abroad ($p>p^*$) we plot the three functions at various levels of p for the alternative cases of real interest rates higher or lower than the corresponding foreign ones, and for reasonable values imposed on other variables (α=0.25, β=0.60).

r^*=0.04, p^*=0.03, r=0.06 and 0.03; k=0.20, v=10).

At any given rate of domestic inflation Figures 2a and 2b reveal the following ranking of the relative easiness to satisfy the internal constraint on the growth rate:

NES > PPP > FER

However, inflation rate is itself determined by the exchange rate regime according to equation (11). This makes the internal constraint in each regime a function of the indexation parameter (λ) and the autonomous rate of wage inflation ($\bar{u}$). for a mumerical illustrating we fix $\bar{u}$ at 4% per annum, and we obtain the minimum growth rates for various degrees of indexation in Figures 3a and 3b. Again NES regime is superior to the other two, given that domestic inflation remains substantially higher than abroad.

Stability conditions (26) may imply unattainable growth rates when real interest rates are too high. With money velocity sensitive to nominal interest rate as implied by equations (27) and (28), rising inflation is not an effective strategy to satisfy the internal constraint. When inflation is approaching hyper levels the public is unwilling to hold real balances ($\varphi(i) \to 0$) and the gains from inflation tax completely evaporate due to the Laffer curve property of function (28), ($p\varphi(i) \to 0$, as $p \to \infty$).

In such circumstances there are two policy options left for the goverment in order to restore long-run stability:

(i) **Active fiscal policy**. An optimal strategy may be devised to manipulate the fiscal variable b(t) in relation to the deviations of the debt stocks from some desired levels. Naturally, it would imply budgetary cuts in periods of rising debt, and expansionist policies when debt stocks are sufficiently reduced.

(ii) **Managed exchange rate policy**. Depreciation rate is set in each period according to a rule that looks after the foreign exchange position of the country. This policy may be supplemented by some fiscal activism aiming to achieve targets of nominal demand.

The dynamics of the above framework, announcement problems associated with rational agents in the currency markets, and issues of foreign exchange intervention to sustain the credibility of such policies are extensively analysed elsewhere (e.g. in Weale et.al., 1989) and are not pursued here any further.

In the following section we shall try to employ the above analysis in order to look at the destabilising debt process of the Greek Economy in the eighties.

3. THE CASE OF GREECE:UNSTABLE DYNAMICS AND POLICY OPTIONS

We consider in this Section the accumulation of domestic and foreign debt in Greece during the 1980s. Although both debt stocks were kept at very low proportions of output in the 1970s, they started rising out of control after the record rise of transfer payments before the elections in 1981 and the further fiscal expansion that was followed by the new government.

Table 2 shows that at least the external stability condition was not satisfied during that period, so that even without these expansions, an unsustainable process would have been evolved, albeit at a much slower pace.

Below we look at the expansion during 1981 - 1985, and then we examine the likely reasons for which the stabilation program in 1985 failed to reverse the process.

Case I: The fiscal expansion 1981-85

As the elections of October 1981 were approaching, the incumbent Conservative Party started to apply an unrestraint fiscal expansion through transfer payments as a strategy to attract votes. As a result budget deficit in 1981 rose to a record 9.80% of GDP[*] after a period of an average rate of around 4% in the previous decade as Table 1 shows. This policy continued unabated in the next years as the socialist government applied the same method to secure the loyalty of its

[*] According to data of European (1989), net borrowing requirement was 11% in 1981. The average in 1982-85 was 9.9%. The difference between figures is attributed to deviations between acruals and realised transactions.

supporters. As a result budget deficits averaged 10.7% of GDP between 1982 and 1985.

Foreign debt was very low at that time, and despite the rising international alert over Third World debted countries in that period there was no serious political consideration of this matter in Greece. We can portray this situation by neglecting the dynamics of foreign debt in (15) and rewrite the dynamics of domestic debt as:

$$\dot{h} = \left(\frac{i}{1+\varphi} - p - g\right)h + \frac{b}{1+\varphi} + \bar{f}_1 \tag{30}$$

where $\bar{f}_1$ should be understood as an exogenously fixed expression.

Authorities were trying to raise the fiscal variable as closely as possible to an ideal high level $\hat{b}$, while paying less attention to keeping the debt close to an acceptable ratio $\hat{h}$, and completely ignoring the repercussions on foreign debt. Their optimisation problem could be stated as follows:

$$\min_{b} J = \frac{1}{2}\int_0^{\infty} e^{-\theta t} \left[q_1(h-\hat{h})^2 + q_2(b-\hat{b})^2\right] dt \tag{31}$$

where θ denotes the discount rate, and q_1, q_2 express the relative weights of debt stabilisation over achieving the desired fiscal expansion.

The Hamiltonian is derived from (30) and (31) as

$$H = \frac{1}{2} q_1(h-\hat{h})^2 + \frac{1}{2} q_2(b-\hat{b})^2 + \sigma\left[\left(\frac{i}{1+\varphi} - p - g\right)h + \frac{b}{1+\varphi} + \bar{f}_1\right] \tag{32}$$

where σ is the backwards discounted shadow price of debt. The decision problem for the government is determined by the first order conditions:

$$\frac{dH}{db} = 0 = q_2(b-\hat{b}) + \frac{\sigma}{1+\varphi} \tag{33}$$

$$\dot{\sigma} - \theta\sigma = -\frac{\partial H}{\partial h} = -q_1(h-\bar{h}) - \sigma\left(\frac{i}{1+\varphi} - p - g\right) \tag{34}$$

Solving (33) for σ and substituting the resulting expression into (34) we get the fiscal rule:

$$\dot{b} = \frac{q_1}{q_2(1+\varphi)}(h-\bar{h}) + \left(\theta + p + g - \frac{i}{1+\varphi}\right)(b-\bar{b}) \tag{35}$$

The process of debt is now governed by the combined dynamics of equations (30) and (35). In order to imply a finite steady state debt-to- output ratio, the saddle path stability condition of one negative and one positive root of the associated characteristic polynomial is required. This condition is met when the determinant of the associated stability matrix is negative, (see Appendix A). In our case it is required:

$$\left(\theta + p + g - \frac{i}{1+\varphi}\right)\left(\frac{i}{1+\varphi} - p - g\right) - \frac{q_1}{q_2(1+\varphi)^2} < 0 \tag{36}$$

When the internal constraint (26.b) is not been satisfied, due to high interest rates or low growth, (36) may be easily translated into the requirement for a low discount rate θ so that future implications of the fiscal expansions are sufficiently taken into account.

However, in 1981 the Greek economy did satisfy the internal constraint as the nominal growth rate (p+g) was 19.8 whilst the interest rate on 12-month Treasury bills was only 14.25 at that time. In fact, this comfort lasted for a few years more until interest rates rose to 18% in 1985. Whatever the value of θ, determinant condition (36) is satisfied. Had the authorities chosen to finance the deficit by selling Treasury bills to the domestic private sector, a much stabler process would have occured gradually leading to stationary, though higher, domestic debt to output ratio (h). Instead the authorities chose to finance the deficit by foreign borrowing and this triggered equation (20).

As real interest rates abroad were substantially higher (eg. 5% in Germany, 5.9% in USA) than the domestic real growth rate of g=0.1%, this sharp rise of foreign debt generated an unstable process implied by equation (20). As interest payments started to accumulate after a while, domestic debt followed on a similarly unstable path.

The consequences of financing a higher budget deficit by increasing borrowing from abroad can be illuminated by using the static diagram of Section 2. In Figure 4 the position of the Greek economy before the fiscal expansion of the 1980s can be stated at point A with a budget deficit at 4% of GDP and an inflation rate 15%, both taken as the average rates during 1975-1980.

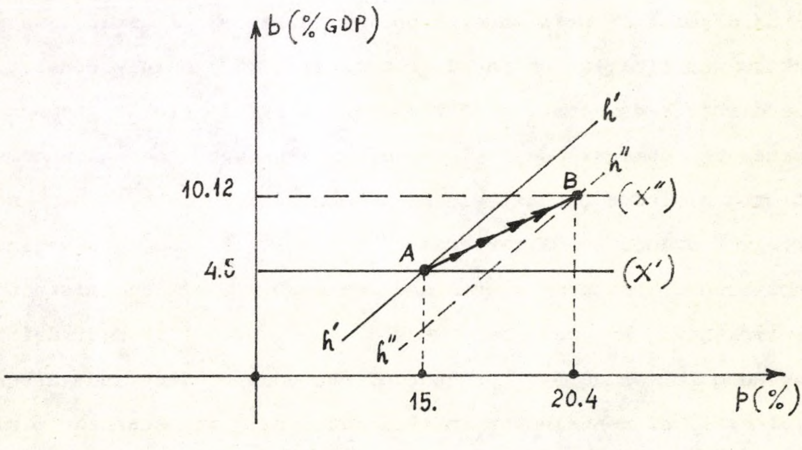


Figure 4: The rise of inflation and deficit in Greece

With foreign indebtness (f) increased and a growth rate lower than foreign interest rates, equation (22) implied a shift of the locus (h'h') downwards. For the same reason locus (X'X') should also move downwards, but this would then require longrun budget cuts as has been explained in Section 2. To raise the locus in order to achieve a higher sustainable budget deficit, the currency had to depreciate substantially as can be worked out by (21). The loci are now intersected at a point B where inflation is higher than before, the currency depreciated, and foreign debt to output ratio risen. Indeed, budget deficit has averaged 10.12% of GDP in 1981-85 with an average inflation rate 20.4%. In the same period the drachma nominal exchange rate depreciated by 52% against the US dollar and by 42% against the ECU.

Case II: <u>The 1985 devaluation</u>.

By 1985 trade deficit of Greece was rapidly deteriorating and the foreign indebtedness of the country started to become a standard point of reference in policy debates. A stabilisation package was finally announced in October 1985, mainly consisting of a discrete devaluation of the drachma by 15% plus a temporary freeze in nominal wage increases. Although the announcement included a pledge on tax reforms and budgetary cuts, they were largely abandoned afterwards, because of the overwhelming opposition of pressure groups and, arguably, of administrative inefficiency. As can be checked in Table 1 budget deficit continued to form a high percent of national product and, after a brief spell of containment in 1986 and 1987, it started rising again. In modelling this situation it is therefore reasonable to simplify the policy problem by considering the fiscal variable (b) as exogenously fixed, and solely concentrate on the dynamics of the foreign debt equation (20). This equation includes both an expression of the current level of real exchange rate (X) and its rate of change (x). In order to make an analytic solution possible, we try below to express the devaluation effect on the trade balance in terms of the depreciation rate only.

Discrete real devaluations $(x>0)$ take the form of one-off changes of parities, so equation (18) should also take into account past devaluations which continue to affect current competitiveness and the trade balance. However, for the case of the Greek economy we can assume that devaluations do not change the trade-balance-to-output ratio in the long run and a new devaluation will be needed to keep it improving. This assumption is in agreement with simulation results obtained by estimated models of the Greek economy, such as Alogoskoufis (1989) and Christodoulakis (1988).

The reasons for this kind of asymptotic neutrality of devaluation (or appreciation) may be one or both of the following:

(i) Real wage resistance. With indexation approaching full scale, competitiveness gains (or losses) evaporate and trade balance and output return asymptotically to their initial real levels. (See Alogoskoufis, 1989, for further elaboration of this effect in the case of Greece).

(ii) Disincentives (or incentives) for microeconomic adjustment of compeitiveness. A depreciation (appreciation) of currency creates an immediate advantage (disadvantage) in relative prices, so that domestic producers may neglect (pursue) other ways of improving competitiveness. In the longrun they fail (achieve) to keep up with productivity changes of foreign producers and trade balance asymptotically returns to the initial levels.

A proper way to express the quickly decaying effect of discrete devaluations is to consider an exchange rate functional

$$\psi(X) = \int_0^t e^{-\mu(t-\tau)} x_\tau d\tau \tag{38}$$

with x_τ being the real devaluation that took place at time τ $(0<\tau<t)$ and μ is the speed of erosion (or recovery) of competitiveness.

If a depreciation takes place at only one time period (say x_0 at $t=0$), its effect is given from (38) by

$$\psi(X) = x_0 e^{-\mu t} \tag{38a}$$

The cumulative improvement that this is going to have on the stock of foreign debt is obviously proportional to the integral of expression (38a) up to infinity:

$$\int_0^\infty x_0 e^{-\mu t} = \frac{x_0}{\mu} \tag{38b}$$

Since in (20) we are solely interested on the total effect that a depreciation has on the stock of debt, we can consider that this improvement comes instantaneously at time t by an amount given by (38b) instead of cumulatively as implied by (20) and (38). This allows to simplify equation (20) into:

$$\dot{f} = (1+\varphi)\gamma_1 h + (r^*-g+x)+\gamma_2 b - \frac{\gamma_3}{\mu}x \tag{39}$$

The government's policy may then be approximated by the attempt to reduce foreign debt to as close as possible a low level $\hat{f}$ by means of the minimum required depreciation rate.

Formally:

$$\min_{x} J = \frac{1}{2}\int_0^{\infty} e^{-\theta t}\left[q_3(f-\hat{f})^2+q_4x^2\right] dt \qquad (40)$$

With θ denoting the policymakers' discount factor and q_3, q_4 the relative priorities between achieving a low level of debt and avoiding an excessive devaluation of domestic currency. To obtain a tractable result, we choose to further simplify the dynamic constraint (20) by linearising the non linear function $\varphi(x) \equiv \varphi(r+p+\alpha x)$ and the revaluation term around the initial levels of foreign debt $(\bar{f})$, domestic debt $(\bar{h})$ and depreciation $(\bar{x}$, which is conveniently assumed to be zero before the stabilisation measures). Equation (20) is thus rewritten as

$$\dot{f} = (r^* - g)f + (\bar{f} - \gamma_4\bar{h} - \gamma_3/\mu)x + \bar{h}_1 \qquad (41)$$

where $\gamma_4 = -(\alpha+\delta)\gamma_1\varphi'$, $\bar{h}$ is the opening domestic debt, that together with $h_1 = \gamma_1\bar{h} + \gamma_2\bar{b}$ are given exogenously, and φ' is the derivative of function $\varphi(\cdot)$ evaluated at $\bar{x}=0$.

Forming the Hamiltonian, stating the first order conditions for devaluation (x) and for the shadow price of foreign debt, and proceeding in a manner similar to that of the previous case, we finally derive the depreciation rule as

$$\dot{x} = \frac{q_3}{q_4}(\bar{f}-\gamma_4\bar{h} - \gamma_3/\mu)(f-\hat{f}) + (\theta - r^* + g)x \qquad (42)$$

Again, the foreign-debt process is asymptotically stable if and only if the determinant of the stability matrix associated with the system of equations (41) and (42) is negative. As with (36) this condition is satisfied by a not-too-high discount rate θ.

Alternatively, we may also write the determinant condition in the form:

$$(\gamma_3/\mu + \gamma_4\bar{h} - \bar{f})^2 > \frac{q_4}{q_3}(r^* - g)(\theta - r^* + g) \qquad (41)$$

With very low initial values of debts $\bar{h}$ and $\bar{f}$, this condition is easily identified as a minimum requirement on the effectiveness of devaluation, so that improvements in trade deficit suffice to asymptotically restore the foreign debt at a finite longrun value. However, reality in 1985 was rather adverse at this point as the already high opening debt $\bar{f}$ made devaluation to inflict serious debiting revaluations that immediately eroded much of the gains reported from the trade front. In fact, as Table 1 demonstrates, foreign debt as a ratio to output continued to be very high despite the stabilisation measures. The trade deficit was only temporarily relieved and by the end of 1987 it had nearly returned to pre-stabilisation levels, thus demonstrating a longrun insensitivity to devaluation.

One of course could argue that far-sighted policy makers should choose a zero discount rate θ in (41) which automatically satisfies the condition. This would have implied a stronger reaction function for the exchange rate in order to obtain such improvements in the trade deficit that were capable of outperforming the revaluation effect. To contain the enormous devaluation-induced inflation, such an extreme policy should have been accompanied by a more radical attack on real wages. But that was politically too risky to be undertaken, apart from any other objections emanating from the angle of social justice regarding the income redistribution effects of devaluation.

The situation can again be portrayed with the aid of the diagram in the deficit-inflation space. With the budget deficit unchanged, the horizontal line (X'X') should remain in the same longrun position.

Setting $\dot{f}=0$ in (41) we obtain that an increase in foreign indebtedness (Δf, say), has to be matched by a depreciation x given by:

$$x = \frac{r^{*}-g}{\gamma_3/\mu-\bar{f}+\gamma_4\bar{h}}\,\Delta f \qquad (44)$$

Depreciation will be stronger, the higher is the opening stock of debt or the faster (higher μ) is the speed of erosion of competitiveness.

The other locus (h'h') does shift. To obtain its equation we return to the original expression (15) in order to include the depreciation term. Setting $i=r+p+\alpha x$ and $\dot{h} = 0$ we get easily an angmented form of (22):

$$b = \varphi hp - [r-g(1+\varphi)]h - (r^{*}-g)f - (\alpha h+f)x \qquad (45)$$

With an increase in x this locus shifts downwards to (h''h'') and the new level of sustainable inflation naturally increases, (point C in Figure 5).

An alternative way of attacking the rising foreign debt would be to cut the budget deficit without depreciating the currency, or perhaps even allowing for some temporary appreciation, given that Greek inflation rate was in any case higher than that of competitor countries even before the stabilization program was announced. From (41) we get for the budget cut:

$$\Delta b = -\frac{1}{\gamma_2}\left[(r^{*}-g)\Delta f - (\gamma_3/\mu-\bar{f}+\gamma_4 h)x\right]$$

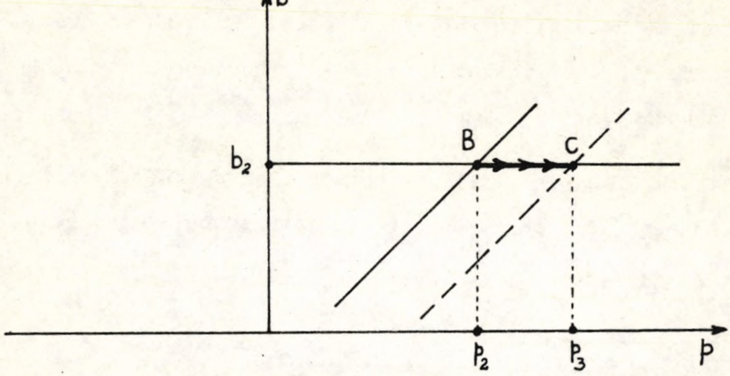


Figure 5 : The inflationary effect of devaluation

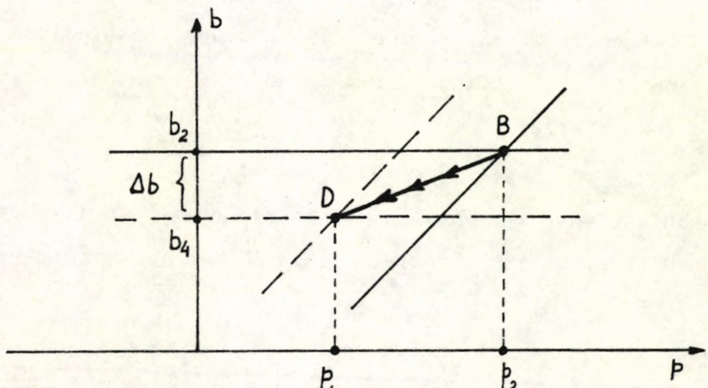


Figure 6 : Budget cuts and disinflation

With $x \leq 0$, the budget cut would be lower, the higher the opening stock of foreign debt-to-output ratio ($\bar{f}$) and the faster the recovery from compeitivess setbacks by the producers. Locus (X'X) moves downwards, while locus (h'h') shifts upwards due to the likely appreciations working their way through (45). The new intersection is now at point D which is consistent with a lower budget deficit and a reduced inflation rate, (see Figure 6). As inflation gets lower, the exchange rate returns to normal levels, thus easing the strain on the trade balance and making the whole system all the more sustainable.

4. CONCLUSIONS

Without fiscal activism, a domestic and foreign debt does not become explosively high relative to output only when the growth rate of the economy exceeds certain bounds determined by domestic and foreign interest rates, the velocity of money and the exchange rate regime. Exploiting the revaluation effect of an appreciated currency, an inflationary-prone country has a better chance to meet the minimum growth constraint, by not depreciating the exchange rate, given that the trade balance is not perpetually deteriorating. Fiscal expansions by shortsighted governments trigger the destabilising process of debt accumulation, whilst devaluation policies may have adverse effects on both the domestic and foreign debt when they ignore the burden of revaluations on the latter as a ratio to output. A dual policy of nominal exchange rate stability (or at least not excessive devaluations) and fiscal restraint seems to asymptotically stabilise the debt-to-output ratios at a lower inflation rate. The trade deficit deterioration implied by the former will at least partly be offset by the demand-reducing effect of the second measure. However, a fuller model would be needed to study further consequences of this policy on output and employment, also part of the macroeconomic objectives, before concluding about the overall merits. It is possible to emerge that nominal exchange rate stability and longrun deficit sustainability would allow the domestic interest rates to fall as the risk premium on holding government debt will be reduced. A reduction in interest rates encourages investment, and thus may trigger the virtuous circle of higher growth and easier debt stabilisation.

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	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989
Int.Rate, Germany	8.5	7.8	6.2	5.7	7.4	8.5	10.4	9.0	7.9	7.8	6.9	5.9	5.8	6.1	
Inflation,Germany	6.0	3.6	3.7	4.3	4.0	4.8	4.0	4.4	3.3	2.0	2.2	3.1	2.0	1.8	2.3
RRI, Germany	2.5	4.2	2.5	1.4	3.4	3.7	6.4	4.6	4.6	5.8	4.7	2.8	3.8	4.3	
Int. Rate, USA	7.0	6.8	7.1	7.9	8.7	10.8	12.9	12.2	10.8	12.0	10.8	8.1	8.7	9.1	
Inflation, USA	9.8	6.2	6.7	7.2	8.9	9.1	7.9	6.3	3.3	3.7	3.1	2.6	3.3	3.3	4.6
RRI, USA	-2.8	0.6	0.4	0.7	-0.2	1.7	5.0	5.9	7.5	8.3	7.7	5.5	5.2	5.8	
Treasury Bill Rate	9.75	9.75	8.25	10.25	14.25	14.25	14.25	15.25	15.25	18.0	18.5	18.5	19.5	19.5	
Consumption Inflation	12.7	13.4	11.9	12.8	16.5	21.6	23.3	21.2	18.2	18.3	18.7	22.2	15.8	13.3	12.8
RRI, Greece	-2.95	-3.65	-3.65	-2.55	-2.25	-7.35	-9.05	-5.95	-2.95	-0.3	-3.7	-3.7	3.7	6.2	
GDP Inflation	12.3	15.4	13	12.9	18.6	17.7	19.8	25.1	19.1	20.3	19.0	19.0	14.3	14.3	13.0
Growth Rate	6.1	6.4	3.4	6.7	3.7	1.8	0.1	0.4	0.4	2.8	1.3	1.3	-0.4	2.8	2.1
Foreign Debt ($m)	3408	3788	4467	4858	5582	7034	8177	9801	11458	11945	15071	17377	19129		
DPX/$	32.28	36.89	37.21	37.11	37.42	43.06	55.43	66.78	87.89	112.72	138.2	139.54	142.	136.	
GDP, bnDr	593	728	844	1016	1245	1523	1856	2285	2721	3362	4132	4928	5539		
GDP, bnDr	672	825	964	1161	1428	1710	2050	2574	3077	3805	4614	5564	6335	7437	8582
Dom.Debt (bn)Dr	99	131	166	280	316	362	508	693	882	1260	1645	1943	2574	3704	
Money Supply (M1)bnDr	128	160	187	228	264	313.	386	471	535	651	797	879	1046		
FD/GDP = f%	16.3	16.9	17.24	15.5	14.6	17.7	22.1	25.4	32.98	35.38	45.14	43.56	42.87		
DD/GDP = h%	14.7	15.8	17.2	24.1	22.4	21.2	24.7	27.0	28.7	33.1	35.6	34.9	40.6	49.8	
Trade Deficit ($m)	3.04	3.33	3.90	4.33	6.177	6.809	6.697	5.927	5.378	5.350	6.268	5.685	6.94	7.63	
(-J/Y)%	14.6	14.90	15.05	13.80	16.18	17.10	18.10	15.37	15.36	15.84	18.77	14.25	15.56	14.00	
Budget Deficit as % GDP(13)	4.7	4.5	4.6	4.4	4.60	4.50	9.80	7.61	10.26	10.6	14.3	12.0	12.82	14.54	
Net Borrowing as % GDP (12)							11.0	7.7	8.3	10.0	13.6	10.8	9.5	12.1	13.3

TABLE 1: Economic data

Appendix A: Stability Conditions

A second order system:

$$\dot{\underline{x}} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \underline{x} = A\underline{x}$$

is asymptotically stable if and only if the roots of the characteristic polynominal

$$\alpha\ (\lambda) = \lambda^2 - (\alpha_{11}+\alpha_{22})\lambda + \det(A)$$

have negative real parts. The conditions for this are:

$$\mathrm{tr}(A) = \alpha_{11} + \alpha_{22} > 0$$
$$\det(A) = \alpha_{11}\alpha_{22} - \alpha_{12}\alpha_{21} > 0$$

In order to have the saddle-path property with one positive and one negative root the condition is simply:

$$\det\ (A) < 0$$

Appendix B: DATA SOURCES

1. Foreign Debt: OECD: Surveys on External Debt, 1983 and 1989. In the 1983 publication total debt in 1982 was 8842 $m, but this has been revised into 9801 $m in the publication of 1988. Figures reported are slightly lower (on the average by 3.8%) than the figures reported for the years 1985-87 in the Finnal Director's Report by the Bank of Greece (1988).

2. Dollar Exchange Rate: Average fixing rates, published by the Statistical Bulletin, Bank of Greece, 1988.

3. GDP at Factor Cost Market Prices: National Accounts, Greece.

4. GDP at Market Prices: European Economy: Annual Economic Report 1988-89, EEC Commission, November 1988. (Table 4).

5. Price deflator of Gross Domestic Product at market prices: ibid (Table 23)

6. Price deflator of private consumption: ibid (Table 24)

7. Growth rate : ibid (Table 10)

8. German Inflation Rate: ibid (Table 23)

9. USA Inflation Rate: ibid (Table 23)

10. Long Term interest rate, Germany: ibid (Table 47)

11. Long Term interest rate, USA: ibid (Table 47)

12. Net borrowing of Central Government: ibid (Table 55)

13. Budget Deficit: Statistical Bulletin, Bank of Greece, 1988.

14. Money Supply: ibid.

15. Domestic Debt: Bank of Greece, Longrun Statistical Series, 1989.

16. Trade Deficit: Compiled from quarterly data, Bank of Greece, Tables.

17. Treasury Bill Rate 12 mongh: Bank of Greece, Tables.

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